

CLAIMS

1. A base band signal generating device comprising:

5 base band signal generating means for converting data consisting of bit strings, in which at least a part of the bit strings is distinguished as a protection object portion, into a base band signal representing a sequence of symbols of four values; and

10 communication quality judging means for judging whether a communication quality of an external transmission path for transmitting the base band signal has reached a predetermined standard,

wherein the base band signal generating means  
15 operates, in a state in which it is judged that the communication quality of the transmission path has not reached the standard, to convert the data into the base band signal such that at least a part of the symbols belonging to the sequence of the symbols  
20 includes a bit belonging to the protection object portion and a predetermined redundant bit, and operates, in a state in which it is judged that the communication quality of the transmission path has reached the standard, to convert the data into the  
25 base band signal such that at least a part of the symbols belonging to the sequence of the symbols includes a bit belonging to the protection object portion and additional data converted into the base band signal together with the data, and

30 wherein a value of the redundant bit is set to a

value that makes an instantaneous value of a point representing the symbol including the redundant bit in the base band signal always converge to a maximum value or a minimum value among four values to which  
5 the instantaneous value can converge.

2. A base band signal generating device comprising:

base band signal generating means for converting  
10 data consisting of bit strings, in which at least a part of the bit strings is distinguished as a protection object portion, into a base band signal representing a sequence of symbols of multiple values; and

15 communication quality judging means for judging whether a communication quality of an external transmission path for transmitting the base band signal has reached a predetermined standard,

wherein the base band signal generating means  
20 operates, in a state in which it is judged that the communication quality of the transmission path has not reached the standard, to convert the data into the base band signal such that at least a part of the symbols belonging to the sequence of the symbols  
25 includes a bit belonging to the protection object portion and a predetermined redundant bit, and operates, in a state in which it is judged that the communication quality of the transmission path has reached the standard, to convert the data into the  
30 base band signal such that at least a part of the

symbols belonging to the sequence of the symbols includes a bit belonging to the protection object portion and additional data converted into the base band signal together with the data, and

5           wherein a value of the redundant bit is set to a value that makes a minimum value of a difference between instantaneous values of two points representing two symbols including the redundant bit and having values different from each other in the  
10 base band signal larger than a minimum value of a difference between instantaneous values of two points representing two symbols not including the redundant bit and different from each other.

15           3.     A base band signal generating device comprising:

          base band signal generating means for converting data consisting of bit strings, in which at least a part of the bit strings is distinguished as a  
20 protection object portion, into a base band signal representing a sequence of symbols of multiple values; and

          communication quality judging means for judging whether a communication quality of an external  
25 transmission path for transmitting the base band signal,

          wherein at least a part of the symbols belonging to the sequence of symbols includes a bit belonging to the protection object portion and a predetermined  
30 redundant bit or additional data converted into the

base band signal together with the data,

wherein the base band signal generating means operates to convert the data into the base band signal such that a larger number of symbols include the  
5 additional data as a communication quality of the transmission path is higher, and

wherein a value of the redundant bit is set to a value that makes a minimum value of a difference between instantaneous values of two points  
10 representing two symbols including the redundant bit and having values different from each other in the base band signal larger than a minimum value of a difference between instantaneous values of two points representing two symbols not including the redundant  
15 bit and different from each other.

4. The base band signal generating device according to claim 1, 2, or 3, wherein the data is constituted by a bit associated with a component that  
20 an object represented by the data can include and the bit takes a value identical with the value of the redundant bit when the component associated with the bit is not present in the object.

25 5. The base band signal generating device according to any one of claims 1 to 4, wherein the base band signal generating means operates to convert the data into the base band signal such that the sequence of the symbols represented by the base band  
30 signal includes a portion in which symbols including

the redundant bit or the additional data and symbols not including the redundant bit and the additional data are alternately arranged.

5           6.    The base band signal generating device according to any one of claims 1 to 5, wherein the data includes a part of a bit string obtained by encoding voice and the additional data includes another part of the bit string.

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          7.    The base band signal generating device according to any one of claims 1 to 5, wherein the data includes a portion in which significance determined on the basis of a predetermined standard is  
15 the highest of the bit string and the additional data includes a portion in which the significance is the lowest of the bit string.

          8.    The base band signal generating device  
20 according to any one of claims 1 to 7, wherein the communication quality judging means includes:

          means for measuring intensity of a signal transmitted on the transmission path; and

          means for judging a communication quality of the  
25 transmission path on the basis of the intensity of the signal measured.

          9.    The base band signal generating device according to any one of claims 1 to 8, wherein at  
30 least a part of the data includes data for error

detection of the protection object portion and the base band signal generating means operates, regardless of a judgment result of the communication quality of the transmission path, to convert the data into the  
5 base band signal such that at least a part of symbols belonging to the sequence of the symbols includes a bit constituting the data for error detection and the redundant bit.

10           10.    The base band signal generating device according to any one of claims 1 to 9, further comprising modulating means for generating a modulated wave using the base band signal generated by the base and signal generating means and sending the modulated  
15 wave to the transmission path.

11.   A base band signal generating method, the method comprising the steps of:

generating a base band signal by converting data  
20 consisting of bit strings, in which at least a part of the bit strings is distinguished as a protection object portion, into the base band signal representing a sequence of symbols of four values; and

judging whether a communication quality of an  
25 external transmission path for transmitting the base band signal has reached a predetermined standard, characterized in that

in the base band signal generating step, processing is performed for, in a state in which it is  
30 judged that the communication quality of the

transmission path has not reached the standard,  
converting the data into the base band signal such  
that at least a part of the symbols belonging to the  
sequence of the symbols includes a bit belonging to  
5 the protection object portion and a predetermined  
redundant bit and, in a state in which it is judged  
that the communication quality of the transmission  
path has reached the standard, converting the data  
into the base band signal such that at least a part of  
10 the symbols belonging to the sequence of the symbols  
includes a bit belonging to the protection object  
portion and additional data converted into the base  
band signal together with the data, and

a value of the redundant bit is set to a value  
15 that makes an instantaneous value of a point  
representing the symbol including the redundant bit in  
the base band signal always converge to a maximum  
value or a minimum value among four values to which  
the instantaneous value can converge.

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12. A base band signal generating method, the  
method comprising the steps of:

generating a base band signal by converting data  
consisting of bit strings, in which at least a part of  
25 the bit strings is distinguished as a protection  
object portion, into the base band signal representing  
a sequence of symbols of multiple values; and

judging whether a communication quality of an  
external transmission path for transmitting the base  
30 band signal has reached a predetermined standard,

in the base band signal generating step,  
processing is performed for, in a state in which it is  
judged that the communication quality of the  
transmission path has not reached the standard,  
5 converting the data into the base band signal such  
that at least a part of the symbols belonging to the  
sequence of the symbols includes a bit belonging to  
the protection object portion and a predetermined  
redundant bit and, in a state in which it is judged  
10 that the communication quality of the transmission  
path has reached the standard, converting the data  
into the base band signal such that at least a part of  
the symbols belonging to the sequence of the symbols  
includes a bit belonging to the protection object  
15 portion and additional data converted into the base  
band signal together with the data, and

a value of the redundant bit is set to a value  
that makes a minimum value of a difference between  
instantaneous values of two points representing two  
20 symbols including the redundant bit and having values  
different from each other in the base band signal  
larger than a minimum value of a difference between  
instantaneous values of two points representing two  
symbols not including the redundant bit and different  
25 from each other.

13. A base band signal generating method, the  
method comprising the steps of:

generating a base band signal by converting data  
30 consisting of bit strings, in which at least a part of



the bit strings is distinguished as a protection object portion, into the base band signal representing a sequence of symbols of multiple values; and

5 a communication quality judging step of judging a communication quality of an external transmission path for transmitting the base band signal,

wherein at least a part of the symbols belonging to the sequence of symbols includes a bit belonging to the protection object portion and a predetermined  
10 redundant bit or additional data converted into the base band signal together with the data,

in the base band signal generating step, processing is performed for converting the data into the base band signal such that a larger number of  
15 symbols include the additional data as a communication quality of the transmission path is higher, and

a value of the redundant bit is set to a value that makes a minimum value of a difference between instantaneous values of two points representing two  
20 symbols including the redundant bit and having values different from each other in the base band signal larger than a minimum value of a difference between instantaneous values of two points representing two symbols not including the redundant bit and different  
25 from each other.

14. A program for causing a computer to execute the steps of:

generating a base band signal by converting data  
30 consisting of bit strings, in which at least a part of

the bit strings is distinguished as a protection object portion, into the base band signal representing a sequence of symbols of four values; and

judging whether a communication quality of an  
5 external transmission path for transmitting the base band signal has reached a predetermined standard,

in the base band signal generating step,  
processing is performed for, in a state in which it is  
judged that the communication quality of the  
10 transmission path has not reached the standard,  
converting the data into the base band signal such  
that at least a part of the symbols belonging to the  
sequence of the symbols includes a bit belonging to  
the protection object portion and a predetermined  
15 redundant bit and, in a state in which it is judged  
that the communication quality of the transmission  
path has reached the standard, converting the data  
into the base band signal such that at least a part of  
the symbols belonging to the sequence of the symbols  
20 includes a bit belonging to the protection object  
portion and additional data converted into the base  
band signal together with the data, and

a value of the redundant bit is set to a value  
that makes an instantaneous value of a point  
25 representing the symbol including the redundant bit in  
the base band signal always converge to a maximum  
value or a minimum value among four values to which  
the instantaneous value can converge.

30 15. A program for causing a computer to execute

the steps of:

generating a base band signal by converting data consisting of bit strings, in which at least a part of the bit strings is distinguished as a protection  
5 object portion, into a base band signal representing a sequence of symbols of multiple values; and

judging whether a communication quality of an external transmission path for transmitting the base band signal has reached a predetermined standard,

10 in the base band signal generating step, processing is performed for, in a state in which it is judged that the communication quality of the transmission path has not reached the standard, converting the data into the base band signal such  
15 that at least a part of the symbols belonging to the sequence of the symbols includes a bit belonging to the protection object portion and a predetermined redundant bit and, in a state in which it is judged that the communication quality of the transmission  
20 path has reached the standard, converting the data into the base band signal such that at least a part of the symbols belonging to the sequence of the symbols includes a bit belonging to the protection object portion and additional data converted into the base  
25 band signal together with the data, and

a value of the redundant bit is set to a value that makes a minimum value of a difference between instantaneous values of two points representing two symbols including the redundant bit and having values  
30 different from each other in the base band signal

larger than a minimum value of a difference between instantaneous values of two points representing two symbols not including the redundant bit and different from each other.

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16. A program for causing a computer to execute the steps of:

generating a base band signal by converting data consisting of bit strings, in which at least a part of  
10 the bit strings is distinguished as a protection object portion, into a base band signal representing a sequence of symbols of multiple values; and

judging a communication quality of an external transmission path for transmitting the base band  
15 signal,

wherein at least a part of the symbols belonging to the sequence of symbols includes a bit belonging to the protection object portion and a predetermined redundant bit or additional data converted into the  
20 base band signal together with the data,

in the base band signal generating step, processing is performed for converting the data into the base band signal such that a larger number of symbols include the additional data as a communication  
25 quality of the transmission path is higher, and

a value of the redundant bit is set to a value that makes a minimum value of a difference between instantaneous values of two points representing two symbols including the redundant bit and having values  
30 different from each other in the base band signal

larger than a minimum value of a difference between instantaneous values of two points representing two symbols not including the redundant bit and different from each other.